

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method of preventing peeling between two silicon layers, comprising the steps of:

providing a first layer having a first silicon material;

performing a hydrogen treatment on the first layer to form a hydrogenated surface thereon; and

forming a second layer having a second silicon material on the hydrogenated surface of the first layer.

2. (Original) The method according to claim 1, wherein the first silicon material is amorphous silicon or crystalline silicon.

3. (Original) The method according to claim 1, wherein the second silicon material is amorphous silicon or crystalline silicon.

4. (Original) The method according to claim 1, wherein the hydrogen treatment is a hydrogen plasma treatment.

5. (Original) The method according to claim 4, wherein operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating temperature of 300~400°C, an operating time of 30~90sec and an operating pressure of 0.1~10torr.

6. (Original) The method according to claim 5, wherein the operational conditions of the hydrogen plasma treatment comprise an RF power of 200Watts, a hydrogen gas flow of 600sccm, an operating temperature of 320°C, an operating time of 60sec and an operating pressure of 0.8torr.

7. (Original) The method according to claim 1, wherein the hydrogen plasma treatment is an HF vapor treatment.

8. (Original) The method according to claim 7, wherein the HF vapor uses HF (49wt%) with a ratio of H₂O: HF= 30:1~70:1.

9. (Original) The method according to claim 4, wherein the hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber.

10. (Original) A method of preventing peeling between two silicon layers in the microelectromechanical structure (MEMS) process, comprising the steps of:

providing a first layer having a first silicon material;

performing a hydrogen treatment on the first layer to form an H-treated silicon surface with Si-H bonds thereon; and

forming a second layer having a second silicon material on the H-treated silicon surface.

11. (Original) The method according to claim 10, wherein the first silicon material is amorphous silicon or crystalline silicon.

12. (Original) The method according to claim 10, wherein the second silicon material is amorphous silicon or crystalline silicon.

13. (Original) The method according to claim 12, wherein the second layer is formed by CVD using SiH_4 as a reaction gas.

14. (Original) The method according to claim 10, wherein the hydrogen treatment is a hydrogen plasma treatment.

15. (Original) The method according to claim 14, wherein operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating temperature of 300~400°C, an operating time of 30~90sec and an operating pressure of 0.1~10torr.

16. (Original) The method according to claim 15, wherein the operational conditions of the hydrogen plasma treatment comprise an RF power of 200Watts, a hydrogen gas flow of 600sccm, an operating temperature of 320°C, an operating time of 60sec and an operating pressure of 0.8torr.

17. (Original) The method according to claim 10, wherein the hydrogen plasma treatment is an HF vapor treatment.

18. (Original) The method according to claim 17, wherein the HF vapor uses HF (49wt%) with a ratio of $H_2O: HF = 30:1 \sim 70:1$.

19. (Original) The method according to claim 14, wherein the hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber.

20. (Original) A method of forming a micromechanical structure, comprising the steps of:

providing at least one micromechanical structural layer above a substrate, the micromechanical structural layer being sustained between a lower sacrificial silicon layer having an H-treated surface and an upper sacrificial silicon layer; and

removing the upper and lower sacrificial silicon layers;

wherein the H-treated silicon surface increases interface adhesion between the lower and upper sacrificial silicon layers.

21. (Original) The method according to claim 20, wherein the lower sacrificial silicon layer is an amorphous silicon or crystalline silicon layer.

22. (Original) The method according to claim 20, wherein the upper sacrificial silicon layer is an amorphous silicon layer or a crystalline silicon layer.

23. (Original) The method according to claim 20, wherein the upper sacrificial silicon layer is formed by CVD using SiH_4 as a reaction gas.

24. (Original) The method according to claim 20, wherein the H-treated surface of the lower sacrificial silicon layer is performed by a hydrogen plasma treatment.

25. (Original) The method according to claim 24, wherein operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating temperature of 300~400°C, an operating time of 30~90sec and an operating pressure of 0.1~10torr.

26. (Original) The method according to claim 25, wherein the operational conditions of the hydrogen plasma treatment comprise an RF power of 200Watts, a hydrogen gas flow of 600sccm, an operating temperature of 320°C, an operating time of 60sec and an operating pressure of 0.8torr.

27. (Original) The method according to claim 20, wherein the H-treated surface of the lower sacrificial layer is performed by an HF vapor treatment.

28. (Original) The method according to claim 27, wherein the HF vapor uses HF (49wt%) with a ratio of H₂O: HF= 30:1~70:1.

29. (Original) The method according to claim 20, wherein the H-treated surface has Si-H bonds.

30. (Original) A method of forming a micromirror structure, comprising the steps of:

forming a first sacrificial silicon layer on a substrate;

forming a mirror plate on part of the first sacrificial silicon layer;

performing an inert gas sputtering on the mirror plate and the first sacrificial silicon layer;

performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon;

forming a second sacrificial silicon layer over the mirror plate and the first sacrificial silicon layer;

forming at least one hole penetrating the second sacrificial silicon layer, the mirror plate and the first sacrificial silicon layer;

filling a conductive material in the hole to define a mirror support structure attached to the mirror plate and the substrate; and

removing the first and second sacrificial layers to release the mirror plate.

31. (Original) The method according to claim 30, wherein the substrate is a glass or quartz substrate.

32. (Original) The method according to claim 30, wherein the first sacrificial silicon layer is an amorphous silicon layer or a crystalline silicon layer.

33. (Original) The method according to claim 30, wherein the second sacrificial silicon layer is an amorphous silicon layer or a crystalline silicon layer.

34. (Original) The method according to claim 30, wherein the second sacrificial silicon layer is formed by CVD using SiH_4 as a reaction gas.

35. (Original) The method according to claim 30, wherein the inert gas sputtering is argon sputtering.

36. (Original) The method according to claim 30, wherein the hydrogen treatment is a hydrogen plasma treatment.

37. (Original) The method according to claim 36, wherein operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating temperature of 300~400°C, an operating time of 30~90sec and an operating pressure of 0.1~10torr.

38. (Original) The method according to claim 37, wherein the operational conditions of the hydrogen plasma treatment comprise an RF power of 200Watts, a hydrogen gas flow of 600sccm, an operating temperature of 320°C, an operating time of 60sec and an operating pressure of 0.8torr.

39. (Original) The method according to claim 36, wherein the hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber.

40. (Original) The method according to claim 30, wherein the hydrogen treatment is an HF vapor treatment.

41. (Original) The method according to claim 40, wherein the HF vapor uses HF (49wt%) with a ratio of $H_2O: HF = 30:1 \sim 70:1$.

42. (Original) The method according to claim 30, wherein the mirror plate is an OMO (oxide-metal-oxide) layer.

43. (Original) The method according to claim 30, wherein the conductive material comprises at least one of W, Mo, Ti and Ta.

44. (Original) A method for forming a micromirror structure, comprising the steps of:

forming a first sacrificial silicon layer on a substrate;
forming a mirror plate on part of the first sacrificial layer;
performing an inert gas sputtering on the mirror plate and the first sacrificial silicon layer;

performing a hydrogen treatment on the first sacrificial silicon layer to form an H-treated silicon surface thereon;

forming a second sacrificial silicon layer over the first sacrificial layer and the mirror plate;

partially etching the first and second sacrificial silicon layers to create an opening exposing a portion of the mirror plate and at least one hole exposing a portion of the substrate;

filling a conductive material in the opening and the hole to define a mirror support structure attached to the mirror plate and the substrate; and

removing the first and second sacrificial silicon layers to release the mirror plate.

45. (Original) The method according to claim 44, wherein the substrate is a glass or quartz substrate.

46. (Original) The method according to claim 44, wherein the first sacrificial silicon layer is an amorphous silicon layer or a crystalline silicon layer.

47. (Original) The method according to claim 44, wherein the second sacrificial silicon layer is an amorphous silicon layer or a crystalline silicon layer.

48. (Original) The method according to claim 44, wherein the second sacrificial silicon layer is formed by CVD using SiH_4 as a reaction gas.

49. (Original) The method according to claim 44, wherein the inert gas sputtering is argon sputtering.

50. (Original) The method according to claim 44, wherein the hydrogen treatment is a hydrogen plasma treatment.

51. (Original) The method according to claim 50, wherein operational conditions of the hydrogen plasma treatment comprise an RF power of 50~300Watts, a hydrogen gas flow of 200~2000sccm, an operating temperature of 300~400°C, an operating time of 30~90sec and an operating pressure of 0.1~10torr.

52. (Original) The method according to claim 51, wherein the operational conditions of the hydrogen plasma treatment comprise an RF power of 200Watts, a hydrogen gas flow of 600sccm, an operating temperature of 320°C, an operating time of 60sec and an operating pressure of 0.8torr.

53. (Original) The method according to claim 50, wherein the hydrogen plasma treatment and the formation of the second layer are preformed in the same processing chamber.

54. (Original) The method according to claim 44, wherein the hydrogen treatment is an HF vapor treatment.

55. (Original) The method according to claim 54, wherein the HF vapor uses HF (49wt%) with a ratio of H₂O: HF= 30:1~70:1.

56. (Original) The method according to claim 44, wherein the mirror plate is an OMO (oxide-metal-oxide) layer.

57. (Original) The method according to claim 44, wherein the conductive material comprises at least one of W, Mo, Ti and Ta.